Cariboo-Chilcotin
Land Use Plan

Regional Biodiversity Conservation Strategy

UPDATE NOTE #5

An Integrated Mountain Pine-Biodiversity Conservation Management Strategy

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Biodiversity Conservation Strategy Committee

Prepared for:

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Biodiversity Conservation Strategy Update Notes are prepared by the Cariboo-Chilcotin Biodiversity Conservation Strategy Committee for purposes of technical clarification or technical additions to the Biodiversity Conservation Strategy report, submitted to the Cariboo-Mid Coast Interagency Management Committee in July 1996. These notes are prepared in response to issues and questions presented to the Biodiversity Committee or recognized by the members of the Committee.

INTRODUCTION

To effectively deal with the MPB outbreak and best meet the biodiversity values outlined in the CCLUP, decisions pertaining to MPB management must be guided by strategic assessments of risk. The long-term implications for biodiversity conservation of short-term actions must also be recognized. To that end, the Biodiversity Conservation Committee has built upon the approaches outlined in the Bark Beetle Management Guidebook (1995) and Maclauchlan and Brooks (1999) by adding explicit considerations for biodiversity at both the stand and landscape levels.

The approach described here represents a mitigative strategy that is intended to maintain options for biodiversity as long as possible. Natural events such as a severe winter are needed to curb the expansion of MPB and hence maintain biodiversity values in the long term.

KEY PRINCIPLES

1. Impacts to biodiversity

Biodiversity values are affected both by the dynamics of the beetle outbreak and the actions to curtail it. At the landscape level, failure to control beetle populations in areas of high susceptibility can result in mortality to extensive areas of mature and old pine. With sufficient mortality, stands may be considered to have moved to an earlier seral condition. However, even stands with high mortality still contain significant biodiversity attributes.

Conversely, logging removes forest structure from the site. The degree of impact is linked to the type of logging but some trees that would have contributed to snags and coarse woody debris are gone and some healthy components of stands are removed to access the dead stems. At the landscape level, clearcut harvesting and the associated roads can create large areas of early seral forest, compromise sensitive sites and fragment the forest matrix.

2. MPB Management Strategies

The identification of management strategies to treat the MPB outbreak is critically important to biodiversity conservation. Management strategies that effectively contain the spread of beetles provide some benefit to biodiversity by conserving remaining non-attacked mature plus old (M+O) pine stands. On the other hand, harvesting strategies that only partially control the spread of the MPB outbreak can unnecessarily diminish biodiversity values.

The most effective strategy for limiting the spread of the MPB outbreak is the suppression strategy. The suppression zone is where the most aggressive treatments occur and the objective is to remove or kill 80-100% of the infestations that occur. The suppression strategy applies to areas where infestations are relatively light, access exists or is imminent and resources exist to effectively deal with most or all of the infestations.

The maintain low zone is intended to slow the spread of the beetle by killing or removing 50% or more of the infestations. Unlike the suppression zone there is little or no compensatory benefit to biodiversity from logging because containment of the beetles is not assured.

In the salvage zone, no containment of MPB is possible and harvesting is primarily for timber recovery purposes. There is no benefit to biodiversity, especially in landscapes that already have extensive areas of early seral forest.

Because the implications to biodiversity differ significantly among these three zones, it is vital that they be mapped objectively and at the finest scale possible.

3. Relative Biodiversity Value

The biological value of a stand is not governed solely by its level of mortality but rather by it's aggregate condition (all attributes considered), relative to other unharvested stands in that landscape. Consequently, landscape level biodiversity value should be assessed in a relative context. A stand with high mortality may have the best old forest representation or the best recruitment potential even though it does not meet all the expected attributes of old forest in an undisturbed landscape.

Under CCLUP, old forest is to be managed as set-asides. This approach, combined with the increasing commitment of the land base through category A cutblock approvals places significant constraints on management options for retaining old forest. In many landscapes, suitable alternatives to the identified old growth areas are not available or soon will not be available.

4. Linkage of Current Practices to Long-Term Susceptibility

Attainment of biodiversity objectives both in the short and long term requires harvest management decisions that focus not only on what is taken but what is left behind. The current MPB harvesting is establishing a pattern on the landscape that can affect the susceptibility of stands to large scale outbreaks in future. Future susceptibility of forests can be reduced by creating a forest mosaic of mixed species and mixed age classes of pine. Accelerated timber harvesting using large clearcuts will create large areas of even-aged pine.

At the stand level, a range of opening sizes with careful retention of non-pine and uninfested pine will ensure a mosaic of stand types and ages. However, without careful management, retention efforts will be compromised due to windthrow or other disturbance agents. Both even-aged and uneven-aged silviculture systems may be used. For large openings, additional stand structure should be retained where opportunity permits.

5. Biodiversity Value of Residual Stand Structure

The post-harvest biodiversity value of a stand harvested for MPB control or salvage depends on the stand structure maintained after harvest. Harvest prescriptions that are carefully designed to minimize harvest of damage to non-pine species and unaffected pine trees will maintain much higher biodiversity values. Careful maintenance of the residual structure is especially important in landscape units where old or mature plus old seral targets are near minimums.

6. Map-Based Assessments

At the landscape level, many organisms are affected by the size, condition and spatial distribution of forest patches. Consequently, approaches to the conservation of biodiversity must entail map-based

assessments of areas needed to meet seral and patch size objectives. To develop harvest objectives that integrate biodiversity conservation, planners need to know the relative abundance and spatial distribution of old and mature +old stands in a landscape unit and know the probability of MPB attack of those stands.
Use of seral assessments alone will not provide the spatial context important to biodiversity or the juxtaposition of remaining M+O patches to infection sites.

7. Site-Specific Ecological Features

Site-specific, non-replaceable ecological features such as riparian reserves, wildlife habitat areas, wildlife features, ungulate winter ranges and some Goal 2 protected area candidates warrant special consideration. Wildlife tree patches, M+O patches and OGMAs can also be irreplaceable if there is no nearby, suitable, replacement forest. Measures to protect these features include: single tree harvesting, fall & burn, pheromone baiting and MSMA application as appropriate to the site and the associated values. Consultation with appropriate MWLAP, MSRM or MOF staff is necessary to identify and apply prescriptions that address site specific values and constraints.

8. Replacement Ecological Features

In some landscape units, the area of M+O and old forest exceeds the seral targets for the NDT-BEC. Where the age, distribution and patch size characteristics of these stands are suitable, and cutblocks have not been approved within them, they provide potential replacements for stands infested by MPB that currently contribute to seral targets. Similarly, in some locations, suitable replacements may exist for wildlife tree patches (WTP) infested with MPB. Assessment of these replacement stands must be consistent with the guidelines for WTP stand structure and distribution.

The process to determine whether such replacement features are available and suitable should involve consultation with appropriate staff from MWLAP, MSRM and MOF.

INTEGRATED MANAGEMENT STRATEGY

Short Term Management

1. Review MPB Zones and Associated Management Strategies

The primarily goal of MPB management is to prevent or slow further spread of MPB to healthy pine. At the stand level, the threat is determined by whether there are live beetles in the trees or not. At the landscape level the threat is based on additional factors including the adjacency of susceptible stands and the ability of government and licensees to effectively remove or kill the active beetle population.

- Consistent with the Bark Beetle Management Guidebook, ensure that management zones realistically reflect opportunities to achieve the identified objectives within the current resource and access constraints.
- Where information permits, map subunits within zones that differ from the overall strategy for that zone.

2. Assess Environmental Condition

The assessment of environmental condition requires spatial data on seral condition and MPB sites. It is important to use the most current information available. Where information is not up-to-date, assessments should still be done but with a more precautionary approach.

- Complete an assessment of LU/BEC seral condition, for all LU/BECs in which available information, including a visual assessment of forest cover maps suggests that Mature + Old and/or Old seral objectives may be at risk..
- Determine the extent of remaining old and mature stands, their relative habitat suitability and overlaps with Category A cutblocks by NDT-BEC in the LU. Use the most current maps and air photos available. Maps should be regularly updated to reflect recent harvesting, planned harvesting, and beetle attack to make the assessments as meaningful as possible.
- Identify site-specific, non-replaceable ecological features in areas of beetle infestation.

3. Determine Integrated Management Strategy

The management strategy focuses on management of ecological features within the context of an overall MPB management strategy. A basic premise in this approach is that an effective MPB-Biodiversity Conservation Strategy must carefully assess risks of no harvesting, partial harvesting, and clearcut harvesting within the ecological feature. Risks must be assessed both in terms of spread of the MPB infestation and biodiversity values at the stand and landscape levels. These risks must be assessed before selecting a management prescription.

Management of Current Attack

The criteria used to assess risk include: the percent current attack within the feature, whether the feature is replaceable and what beetle management objectives are in place. The bark beetle management objectives are based on the strategic zonation into *suppression, maintain low* and *salvage* zones.

Current Attack	Infectious pine stands containing live beetles. Trees may be green or red attack
Old Attack	Non-infectious pine stands. Trees may be red or grey attack.
Suppression zone	The objective is to sanitize stands of 80-100% MPB infestations. It is applicable to lightly infested areas where access exists or is imminent and milling capacity meets or exceeds the supply of timber.
Maintain Low zone	The objective is to slow spread of MPB by removing 50% or more of the infested stands.
Salvage zone	The objective is primarily timber recovery since management efforts would be ineffective in substantially reducing the beetle population and subsequent levels of damage.

The following sections of this document are meant to apply to areas that are predominantly (>80%) pine. For mixed stands with a minor (<20%) component of pine, the forest health threat to the

ecological feature and surrounding stands is much diminished. Therefore, if any harvesting is undertaken inside the ecological feature it should selectively remove infected stems only. Often the best option will be to refrain from harvesting the pine in this situation. Where pine is <80% but a significant proportion of the ecological feature, treatments should emphasize single tree or small patch cuts. However, if the ecological integrity of the feature as a whole is threatened, then replacement areas should be considered. Any harvest or damage of non-pine or non-susceptible pine must be minimized.

Current Attack <1% of the Susceptible Trees Within the Ecological Feature

Treatments should retain the ecological integrity of the ecological feature by selectively treating only those trees that contain live MPB. Treatments include fall and burn, pheromone traps, MSMA and single tree harvest.

Treatments can be applied in all management zones but the suppression zone should have priority.

Current Attack >1% of the Susceptible Trees Within the Ecological Feature

Where current attack levels exceed 1%, a comprehensive beetle probe should be implemented according to a fixed grid over the ecological feature. The density of the grid will depend upon the size and ecological value of the feature. High value ecological features with small areas such as riparian zones would require a much finer grid than a MDWR or large OGMA. Grid cells should not be greater than 2 ha. Probe results should display the percent attack by area for the entire ecological feature and for each cell in the grid.

a) Current Attack 1-10% of the Susceptible Trees Within the Ecological Feature

Where attack levels are between 1 and 10%, treat infectious pine using single tree or small patch cuts. A "patch cut" is considered, for the purposes of this strategy, to be a small opening less than 1 ha. and often no more than 30 m in diameter. Where the feature is small or very narrow, such as riparian zones, patch cuts must be carefully considered with respect to retaining structural and functional integrity of that ecological area.

b) Current Attack >10% of the Susceptible Trees Within the Ecological Feature

Replacement Features Available:

The integrity of an ecological feature may be at serious risk once current attack levels exceed 10%. Therefore, where suitable replacement features exist, harvest the attacked pine and identify the alternate area as the replacement. This option is only possible for some WTP, OGMAs and M+O patches. Other ecological features are site specific and cannot be replaced.

Replacement Features Not Available:

Where features are geographically fixed or suitable replacements do not exist in the same landscape, that feature must be managed to retain as much of its structural and functional integrity as possible.

The MPB management zone classification becomes very important because containment of beetles is highly unlikely in any zone other than suppression.

- Maintain Low and Salvage Zones: selectively remove attacked trees if necessary to protect the ecological feature itself. Otherwise, retain stand structure (do not remove attacked pine) despite the presence of MPB. Stand structure includes dead trees.
- Suppression Zone: kill or remove infectious pine using single tree, patch and clearcut treatments. Clearcut harvest only applies to individual cells having >10% attack.

Healthy trees must sometimes be taken to access current attack when ground-based harvest equipment is used. It is important that access harvesting be minimized and the least destructive route be taken to reach the current attack. Generally, access harvesting should amount to less than 10% of the total volume harvested.

Management of Old Attack

Since old attack consists of non-infectious trees, any harvesting is primarily for timber recovery purposes, not forest health. The length of time the dead trees will remain merchantable is not well known but based on previous outbreaks, it is assumed to be some years, allowing sufficient time for review of landscape condition and proposed developments prior to harvesting approvals being granted.

In order to meet biodiversity objectives, decisions to harvest in ecological features must therefore be based on replacement of the features with ecologically suitable areas of similar size in the same LU NDT-BEC unit. Where suitable replacement areas are not available, biodiversity objectives should be met using the existing ecological features even if they contain beetle-killed trees. Site specific ecological features have no options for replacement.

Ecological Suitability

The suitability of replacement areas is based upon the attributes of the proposed replacement stand compared to the current condition of the existing, attacked stand.
To facilitate quick assessments, seral age, MPB mortality and patch size/location are the main attributes considered. The replacement stand must not have any category A approved cutblocks within it. It is important to use current information when doing assessments but where information is not up-to-date, uncertainty can be dealt with by using a higher threshold for biodiversity objectives. Consultation with appropriate WLAP, MSRM or MOF staff is recommended in determining ecological suitability of replacement areas.

Salvage Harvesting Choices

- Because ecological features are needed in each landscape to meet CCLUP biodiversity objectives, **salvage** harvest should focus first on stands outside the ecological feature.

- Salvage harvesting **should be** considered within ecological features when stands outside it have better ecological attributes. For example, if an OGMA currently has 60% mortality and there are equivalent stands in the same landscape with 30% mortality, it would be appropriate to harvest the OGMA and replace it with the alternative. Where an ecological

feature has high mortality and replacement stands are much younger, consultation is required to determine the stand preferred for retention to meet the biodiversity targets.

- Generally, ecological features with 30% or less mortality should not be salvage logged.

Long-Term Management

The "prevention" strategy outlined in the *Bark Beetle Management Guidebook* focuses on manipulation of forest cover to reduce the chance of severe MPB outbreaks in future. The essence of the approach is the creation of a mosaic of different species and age classes of forest combined with an access network that facilitates ground-based treatment of small outbreaks.

To achieve this model, it is necessary to schedule and locate harvest blocks in a manner that promotes the desired mix of species, patch sizes and seral conditions across the landscape. Clearly, the harvesting approach applied during the current outbreak can have a profound influence in determining this mosaic. Accelerated rates of cut will promote large areas of similar aged pine, and large openings will result in future contiguous patches of susceptible stands. At the stand level, block layout and silvicultural systems that promote mixed species/mixed age stands will contribute to less severe future outbreaks by providing less contiguous areas of susceptible pine.

Beetle proofing is a recognized technique that could be used to reduce susceptibility of key stands for a period of time. Interventions to thin stands according to the criteria in Maclauchlan and Brooks (pp. 41-42) could be applied in specific areas to reduce threats of MPB outbreak in mid seral and mature stands. This technique could be especially important in protecting site-specific ecological features. Introduction of low-intensity fire could also be used to modify stands in selected areas

The greatest flexibility in harvest planning is associated with healthy, green stands, followed by stands with limited mortality. Current-attack stands have the least flexibility in harvest planning due to the need to reduce MPB spread. As such, priorities for harvest should be:
1. Current attack trees
2. Old attack trees
3. Healthy trees

Among sites with MPB mortality, those with the highest mortality should be the leading candidates for salvage harvest. By following these priorities for harvest, the best available opportunities for landscape design are preserved.

In areas where lodgepole pine is the dominant species, the current model of managing old forest by creating permanent set asides puts them at considerable risk of MPB attack over time. Because of the prevalence of MPB in the NDT3-SBPS and SBS zones, and the lower age threshold of 140 years for old forest in these BEC zones, a continuous recruitment model would provide greater assurance of maintaining old and mature pine forest despite MPB. As opposed to the current approach, a continuous recruitment model would promote an age class structure that continually moves stands into the mature and the old seral categories, thereby providing suitable replacement candidates should old forest stands be lost to natural disturbance or directed harvest. A continuous recruitment

model would also promote a balanced age class structure, thereby reducing the prevalence of extensive, even-aged tracts of pine.

Considerations for Long-term Management

- Schedule harvest to create a distribution of Pl age-classes
- Provide a range of opening sizes
- Focus timber recovery on stands with the greatest mortality first
- Utilize a range of silviculture systems to promote within-stand diversity
- Retain and promote species other than pine at both the landscape and stand levels.
- Manage old forest using a "continuous recruitment" model in the NDT3-SBPS and SBS zones in areas where lodgepole pine is the dominant species.
- Retain large diameter trees, including deciduous in WTP to maintain cavity-nesting, avian predators on MPB.

Linkage to Salvage Direction in Integration Report

The CCLUP Integration report used an assumption that up to 10% of the area of OGMAs could be available for timber salvage over the rotation. The approach described here outlines procedures for maintaining biodiversity during a severe MPB outbreak situation, with the emphasis upon controlling current attack due to the immediate implications of spread. With these procedures an unknown amount of timber may be harvested from OGMAs and other ecological features, especially if the outbreak continues. Should the outbreak decline in the near future, salvage opportunities can be reviewed in light of the overall landscape condition and risks of future outbreaks of MPB or other forest health agents.

REFERENCES

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